
Guideline for Identification of Best Available Control Technology - Economically Achievable (BACTEA) for Ontario Regulation 194/05 “Industry Emissions – Nitrogen Oxides and Sulphur Dioxide”

PIBs 5169e

1. Introduction

Ontario Regulation 194/05 “Industry Emissions - Nitrogen Oxides and Sulphur Dioxide” (the Regulation) includes provisions for new and expanding facilities in regulated sectors to receive allowance allocations. To determine allocations for such facilities, the Regulation provides for allocations based on emission levels that correspond to the application Best Available Control Technologies - Economically Achievable (BACTEA). The BACTEA requirement applies to equipment that emits nitrogen oxides or sulphur dioxide, has a heat input greater than one million Btu per hour) and is new or has been modified since the Regulation was made.¹

These BACTEA requirements ensure that facility owners consider all available alternatives, and select from among the best available nitrogen oxides (NO_x)/ sulphur dioxide (SO₂) control technologies as the basis for determining allocations from the New Source Set Aside (NSSA) under the Regulation, sections 20 (NO_x) and 34 (SO₂). Furthermore, it provides a step by step process for facilities to determine the BACTEA intensity rates.

The purpose of this Guideline is to provide guidance on how to undertake a BACTEA determination for either new or expanding facilities regulated under the Regulation. The determination is applicable only to equipment and processes that are either new or modified and that lead to or could lead to an increase in facility production.

The determination consists of eight steps, including an assessment of technical feasibility and the application of economic achievability ranking criteria. Facility owners should repeat the first seven steps for each new or modified piece of equipment or process that emits NO_x and/or SO₂, to arrive at a BACTEA determination for either the new or expanded facility. Facilities must present their analyses of all potential BACTEA technologies to the Ministry of the Environment Director (the Director), including the application of the economic achievability ranking system described herein. The Director will base each facility's NSSA allocation (and transfer to its sector budget or facility allocation for fixed-allocation sectors) on the emissions it would produce if it had applied BACTEA to all new or modified equipment with heat input greater than one million Btu per hour. The facilities may install equipment other than that identified through the BACTEA determination, but they must comply with the requirements of the Regulation (i.e., at the end of every year they must retire sufficient allowances and credits to match their NO_x and SO₂ emissions).

In no event shall any BACTEA determination permit the facility owner to violate the requirements of any applicable act, regulation, standard or guideline.

¹ Equipment means either one distinct piece of equipment or a combination of pieces of equipment meant for one distinct purpose. Btu means British thermal unit.

1. BACTEA Evaluation

The BACTEA evaluation of a particular process requires a case-by-case analysis that is prepared either by or on the behalf of the facility owner. A BACTEA evaluation should be completed for each new or modified process that produces NO_x and/or SO₂ emissions and leads to or could lead to an increase in production (provided that the process contains equipment with heat input greater than one million Btu per hour). The facility owner will use the likely emissions given these BACTEA evaluations for each new or modified equipment or process, along with the emissions from all other sources at the facility, to determine a BACTEA intensity rate for either the entire new or the expanding facility.

Facility owners should complete the BACTEA evaluation for equipment (with heat input greater than one million Btu per hour) that has been modified or added since the Regulation was made and that contributed to an increase in production, and proposed new modifications and equipment that is planned increase the facility's production. Facility owners should base their evaluations of prior modifications on the technologies that were available at the time the modification was made.

The steps in the evaluation are as follows:

1. Identify All Potential NO_x and SO₂ Control Technologies for Pertinent Industry and Process.
2. Eliminate Technologies Not Used at Comparable Facilities
3. Eliminate Technically Infeasible NO_x and SO₂ Control Technologies
4. Rank Control Technologies by Effectiveness
5. Evaluate Control Costs
6. Select BACTEA
7. Repeat Steps 1 to 6 for each distinct new process
8. Determine BACTEA Intensity Rate
9. Obtain Third-Party Certification
10. Submit BACTEA Results and Documents to the Ministry of the Environment (MOE)
11. MOE Reviews BACTEA Submission

Additional details on each step follow below.

Step One: Identification of Control Technologies

The facility owner must identify all available control technologies with potential for application to NO_x and/or SO₂ emitting equipment with heat input greater than one million Btu per hour. This list should include alternative production processes, pollution prevention techniques and add-on controls.

The following is a perfunctory list of examples of potential control technologies:

- process controls or changes
- alternative fuels or combustion techniques
- source reduction

- add-on abatement equipment
- good engineering practices.

Step Two: Elimination of Technologies Not Used at Comparable Facilities

The facility owner may eliminate control technologies identified in Step One that are not either proven, commercially available or technologies used at other facilities in the same industry that compete in the same output market.

Step Three: Elimination of Technically Infeasible Options

The facility owner must review the control technologies and eliminate any technically infeasible control technologies.

The submission to the Director must include all supporting information including the physical, chemical, engineering principles, and control efficiencies (i.e., per cent, relative to uncontrolled processes, of pollutant(s) removed) for each control technology). The submission must include the technical difficulties, including incompatibilities with existing equipment (if the application is in response to a proposed expansion), that demonstrate the technical infeasibility of the control technologies that the facility owner claims are infeasible.

Step Four: Ranking of Technically Feasible Control Technologies by Effectiveness

The facility owner must establish a hierarchy of technically feasible control technologies ordered from highest to lowest control efficiency. This ranking forms a part of the facility owner's application to the Director (see below).

Control efficiency is the primary criterion, but facility owners should also document the expected total mass of emission reductions the various technologies would achieve if applied to the new and modified equipment and processes at the facility.

The facility owner should base the estimate of uncontrolled emissions on an estimate of average annual production in a typical production year.

The facility owner can determine a pollution control technology's achievable performance by referencing manufacturers' data, engineering estimates, historical performance data and technology reviews performed by either the United States Environmental Protection Agency (US EPA) or an environmental branch of the European Union or one of its member countries. Facility owners may use other review data as they wish, if they provide proof of the validity and rigour with which these evaluations have been executed.

If facility owners choose to use control equipment manufacturers' data in their determinations, they should ensure that the manufacturer guarantees these data. Facility owners must present proof of this guarantee and all such information necessary for the Director to make a decision.

Submission Requirements

In their submissions, facility owners must include the following information for each technology they rank, for each process:

- Expected emission control efficiency (i.e., per cent of pollutant removed, emissions/unit of product, where possible)
- Emissions performance level (tonnes /year in average year at full operation)

Facility owners may skip directly to Step Six if they wish to select the control technology that is ranked first after this step as the BACTEA for the process concerned.

Step Five: Evaluating Control Costs

Estimating Control Costs

The facility owner must specify the vendor-supplied design parameters of the control technology before estimating the costs of purchasing, installing and operating the control technologies.

To estimate the cost of the control technology, the facility owner must first specify the limits of the process (e.g., control system battery limits). Next, the facility owner must list the cost of each major piece of equipment. The facility owner must document all relevant costs. Vendor quotations and other reliable means should form the primary basis for the estimates. Facility owners should refer to the methods outlined in the most recent US EPA's Office of Air Quality Planning and Standards Control Costing Manual or the US EPA's Draft New Source Review Workshop Manual for examples of reliable methods of estimating control technology costs. The facility owner must choose a base year for all cost estimates and adjust all control technology cost estimates, if necessary, to that year.

The facility owner must annualize the capital cost of each piece of control equipment over its useful life, using the long-term bond rate.²

The facility owner must add annual operating and maintenance costs associated with operation of each control technology to the annualized capital cost derived in the previous step to arrive at the **annual control cost** associated with each control technology. Please refer to Appendix One for guidance on how to calculate annualized costs.

Evaluating Cost Efficiency

The primary cost evaluation consideration is cost efficiency. The facility owner can use the annual control costs of various control technologies to determine the cost efficiency (in dollars per tonne) of each. The cost efficiency is the quotient determined by dividing the annual control cost given in dollars per year by the expected emission reduction rate given in tonnes per year. These cost efficiency figures, and the control efficiency figures determined in Step Three are used in the Selection of Best Available Control Technology, Step Six (below).

² In effect, this means that the facility owner must model the cost of the equipment as if its purchase is financed out of debt, with an interest rate equal to the long term bond rate in effect at the time the analysis is undertaken.

Step Six: Selection of Best Available Control Technology

In determining BACTEA, the applicant can select any technology that has a removal efficiency that is within 15 percent of the control technology with the highest control efficiency determined in Step Four.

If several control technologies have removal efficiencies within 15 per cent of the technology with the highest removal efficiency, the facility owner may ask the Director to base the allocation on the most cost efficient (i.e., lowest cost per tonne removed, determined in Step Five) control technology selected from the group.

For example, if the technology in use at comparable facilities and with the highest removal rate eliminates 98 per cent of NO_x from an exhaust stream, then a comparable technology would not remove less than 83 per cent ($98 - 15 = 83$) of NO_x from the same exhaust stream.

Step Seven: Repeat Steps One to Six for New Processes and Modified Processes

To determine the BACTEA facility intensity rate for the facility, the facility owner must repeat Steps One through Six for each new or modified process that includes equipment with heat input greater than one million Btu per hour.

Documentation of the BACTEA evaluation (i.e., steps one through six) is also needed for equipment with heat input greater than one million Btu per hour that has been modified since the promulgation of the Regulation or the last application for allowances from the New Source Set Aside.

Once a BACTEA has been determined for each new or modified process in the new or expanded facility the facility owner may proceed to Step Eight.

Step Eight: Determine BACTEA Intensity Rate and Submit BACTEA Report

The BACTEA intensity is the quotient determined by dividing the facility's emissions (given the application of the BACTEA to each applicable process) by the estimate of the amount of Regulated Product that the facility will produce in a typical production year. The facility owner must include NO_x and SO₂ emissions from all stationary sources at the site in this calculation, including those that have a heat input of less than one million Btu per hour, and from processes and equipment that have not been modified.

BACTEA intensity = $\frac{\text{emissions from entire facility assuming use of BACTEA on new/modified processes}}{\text{estimated average annual production}}$

The facility owner should include the inputs, assumptions and results of this calculation in the report. In addition, the facility owner must include the best estimate of the number of years, after commissioning the new or modified facility, until the expanded facility will reach full production levels.

Step Nine: Obtain Third-Party Certification of BACTEA Report

Facility owners must have a person who holds a license issued under the *Professional Engineers of Ontario Act* to engage in the practice of professional engineering certify the application submitted is complete, accurate and completed in accordance with the requirements of the Regulation.

Step Ten: Submit BACTEA Determination Results

The facility owner's BACTEA report should include:

1. General and identification information (name, address, telephone number, fax number, manager name, etc.);
2. Descriptions of new production processes;
3. Description(s) of the product(s) the facility produces;
4. A description of the production equipment that has been added or modified, including equipment rating and size;
5. References to US Environmental Protection Agency's RACT/BACT/LAER Clearinghouse or a European Union (or member country's) BACT database, where possible;
6. Company information, Certificate of Approval information (if available), and the industry-level (i.e., five-digit) North American Industrial Classification System code pertinent to the facility;
7. All supporting information, including the list of technologies identified in Step One and the rationale for elimination of those that were eliminated in Steps Two and Three;
8. The emission reduction option(s) chosen to be BACTEA for each process or piece of equipment;
9. A detailed description of the emissions reduction method/equipment offered as BACTEA, and all control technologies that have higher removal efficiencies than the proposed BACTEA;
10. Description of main product market including geographic scope;
11. Emission-related information (pollutant information, points of emissions, emissions rate, fuel requirements, control equipment, costs, etc.);
12. If the facility owner is making an application in respect of a new facility, the facility owner's best estimate of the amount of Regulated Product that the new facility will produce in an average year once the facility has reached full production levels;
13. If the facility owner is making an application in respect of a facility expansion, the facility owner's best estimate of the additional amount of Regulated Product the facility expansion will allow the facility to produce, as well as the total amount of Regulated Product the entire expanded facility will produce in an average year once the expanded facility has reached full production levels;
14. The BACTEA intensity rate, calculations and data to support the determination of the rate.

Confidential application information should clearly be marked as such.

The facility owner must send the BACTEA determination results, including all the documentation listed above, to the Ministry of the Environment at the following address:

Ministry of the Environment
Industry ERP - NSSA BACTEA Determination
c/o Air Policy and Climate Change Branch
135 St. Clair Avenue West, 4th Floor
Toronto, Ontario
M4V 1P5

The applicant must submit the BACTEA determination results, including but not limited to all the documentation listed in Step Six above, by January 1 of the year prior to the year for which it is applying for the allowances. For example, if a facility owner desires to have allowances for new production for the 2008 compliance year, he or she must apply no later than January 1, 2007.

Step Eleven: Ministry Reviews BACTEA Determination

Upon receipt of a facility owner's application under the Regulation for a determination of the intensity rate in respect of the facility, the Ministry will confirm receipt of the application and inform the facility owner if there are any obvious outstanding items. Subsequently, the Director will review the facility owner's application.

If the Director determines that the facility owner's application is deficient, implausible or otherwise inadequate to support the selection of the proposed technology as BACTEA, the Director will inform the facility owner of the inadequacy of its application and may return the application package to the facility owner. In such an instance, the facility owner will be required to provide the requested information or amend its BACTEA determination and resubmit it to the Ministry. It is in the facility owner's best interest to ensure that the original submission is comprehensive and that claims therein are valid, as the facility owner will be required to comply with the Regulation regardless of the status of its application for NSSA allowances.

The Director will inform the applicants of his or her decision within 90 days-

The applicant will have 15 days to appeal the Director's decision. Please see sections 17 (NO_x) and 31 (SO₂) for more information on BACTEA application rules.

Appendix One - Cost Calculations

Calculating Costs

Capital Costs

For the purposes of this guideline, total annual cost (TAC) has three elements: direct costs (DC), indirect costs (IC) and recovery credits (RC). The following equation expresses the relationship between these elements:

$$TAC = DC + IC - RC$$

Direct Costs: costs of equipment, taxes, labour, site preparation, installation, etc. Vendors can usually supply these costs.

Indirect Costs: costs that the facility owner would incur even if the system were shut down. An example of indirect cost would be overhead costs (e.g., property taxes, insurance, etc.) Also includes one time costs such as engineering, performance tests, etc.

Recovery Credits: the materials or energy recovered by the control system that are sold, recycled into the process or reused on site.

Note: the facility owner should not consider the cost of land as a part of the cost of the control technology.

General Annualization Formula

$$TAC = [(O\&M - SAV) \times (1-T)] + [(K \times (I/(1 - (I+1)^{-n}))) \times (1 - T)] - [REV \times (1 - T)]$$

TAC = total annualized cost

O&M = operating and maintenance costs

SAV = cost savings

T = income tax rate

K = capital cost

I = long-term bond rate

n = life of abatement equipment or system

REV = revenues from by-products or co-product sales

where $T = 0$, TAC represents the "before tax" net cost which is also the cost to society; and

where $T > 0$, TAC represents "after tax" cost which is borne by the polluter.